

these precautions you need not fear failure, and you will enjoy the spectacle so seldom seen, though so often actually occurring, of *hot water floating on the top of cold water*.

It is almost as easy to demonstrate the fact that solid bodies, such as wood, iron, and glass, expand when heated. A steel knitting-needle, for example, is both longer and thicker when hot than it is when cold. To prove so minute a quantity as the increase in thickness would require very delicate apparatus indeed, but the increase of *length* may be rendered visible by the following simple arrangement given by Miss C. Martineau in her capital "Easy Lessons in Heat." The knitting-needle must be fixed firmly to the table by a table-clamp (Fig. 13). Against the other extremity rests the end of a straw to serve as an index or pointer. This straw, which should be at least eight or nine inches long, is transfixed by a pin at about a quarter of an inch above the point where it touches the knitting-needle, the pin being stuck into a block of wood or other substantial support. The slightest movement of the end of the steel needle will be rendered apparent by the movement of the straw index.

Another pretty experiment which is easily performed is that of boiling water in a sheet of paper. Take a piece of paper and fold it up, as schoolboys do, into a square box without a lid, as shown in Fig. 14. Hang this up to a walking-stick by four threads, and support the stick upon books or other convenient props. Then a lamp or taper must be placed under this dainty cauldron. In a few minutes the water will boil. The only fear is lest the threads should catch fire and let the water spill into the lamp and over the table. The flame must therefore not be too large. A small taper will give a flame quite large enough. The paper does not burn, because it is wet; and even if it resisted the wet it still would not burn through, because the heat imparted to it on one side by the flame would be very rapidly conducted away by the water on the other. Another experiment of a similar nature, but perhaps even more striking, is as follows:—Twist up the edges of a common playing-card or other bit of cardboard, so as to fashion it into a light tray. On this tray place a layer of small shot or bits of lead, and heat it over the flame of a lamp. The lead will melt, but the card will not burn (Fig. 15). It may be charred a little round the edges, but immediately below the lead it will not be burned, for here again the lead conducts off the heat on one side as fast as it is supplied on the other. Lastly, we give an experiment which, like the two preceding, proves that a good conducting substance may protect a delicate fabric from burning by conducting away the heat rapidly from it. Lay a piece of muslin quite flat upon a piece of metal. A live coal placed on the muslin will not burn it, for the metal takes away the heat too fast. If the muslin is however laid on a bad conductor, such as a piece of wood, it will not be protected, and the live coal will kindle the muslin.

(To be continued.)

NOTES

THE International Congress of Anthropology and Prehistoric Archaeology, which opens at Lisbon on the 19th inst., promises to be an interesting one. On the mornings of the 21st, 23rd, 25th, and 27th, questions relative to Portugal will be discussed—Cut Flints of the Tertiary, Characteristics of the Palæolithic or Quaternary Age, the Neolithic Period, Kitchen-middens, Sepulchral Caves, Age of Metals, &c. Among the papers to be read on the afternoons of these days are the following:—M. Arcelin, Antiquity of Man in the Valley of the Saône; M. E. Catailhac, Recent Prehistoric Discoveries in the South of France; M. Ernest Chantre, an Exploring Journey in the Caucasus; M. Hildebrand, the State of Prehistoric Studies in Sweden; M.

Schaffhausen, Prehistoric Man, &c. Several interesting excursions have been arranged for. Perhaps the most important question to be brought before the Congress will be that of the worked stones said to have been found by M. C. Ribeiro in the Tertiary. The Local Committee have opened numerous cuttings between Carregado and Cereál, and in that distance of twenty kilometres it is stated that worked stones will be met with at every step in the Miocene deposits. The railway companies of Spain and Portugal will issue tickets at a reduction of one-half to members of the Congress.

At the approaching Congress at Edinburgh on October 6 to 13, the discussion on the first special question in the Educational Department, "What may be the dangers of educational over-work for both sexes, with special reference to the higher class of girls' schools, and the effects of competitive examinations?" will be opened with papers by Dr. Keiller, M.D., of Edinburgh, and Miss Edith Peachey, M.D., of Leeds. Papers on the second special question, "How far, and under what conditions, ought the teaching of higher subjects in elementary schools to form part of a system of national education?" will be contributed by Sir George Campbell, K.C.S.I., and Dr. Robertson, LL.D. Prof. Laurie will read a paper on the third special question, "Is it desirable that public secondary schools should be placed under local authorities and be subject to the supervision of the Committee of Council on Education?"

We are glad to learn that Mr. Mundella intends, during his sojourn on the Continent, to visit some of the principal foreign technical schools. We have no doubt he will thus get some enlightenment as to what real technical education means.

THE Geological Society of France have issued circulars announcing that an extraordinary session will be held at Boulogne, from September 9 to 19, under the presidency of Prof. Gosselet of Lille, with an ample programme of papers and excursions.

At a meeting of delegates from local scientific societies, held at Swansea on August 31, Mr. J. Hopkinson in the chair, various suggestions, principally with the view of securing a better representation of scientific societies at the meetings of the British Association and a more intimate relationship between provincial societies, were made, and the following resolutions were passed:—1. That this Conference recommends that at future meetings of the British Association it is desirable that the delegates from the various scientific societies should meet, with the view of promoting the best interests of the Association and of the several societies represented. 2. That Mr. Hopkinson and Mr. Fordham be a committee to carry out the views expressed at this conference, and report to the conference of delegates to be held at York in 1881, in accordance with the foregoing resolution.

To judge from the three volumes of its *Bulletin* which have been sent us, the Philosophical Society of Washington seems to produce some good work. The Society was founded ten years ago, and the volumes embrace the period from 1871 to 1880. The late Prof. Joseph Henry was the first president of the Society, the object of which is stated to be the free exchange of views on scientific subjects and the promotion of scientific inquiry among its members. The following are a few of the papers contained in the volumes before us:—"On the Adopted Value of the Sun's Apparent Diameter," by Prof. F. S. Holden; "On the Delta of the Mississippi," by Prof. Forshey; "On the Zodiacal Light," by Prof. S. Alexander; a detailed report on the unusually brilliant meteor of December 24, 1873; a long and elaborate memoir of Prof. Joseph Henry, with detailed notices of his varied scientific work; also the addresses he delivered during his presidency; "On the 'Prodromus Methodi Mammalium' of Storr," by Mr. Theodore Gill; a curious inquiry on the

Number of Words used in Speaking and Writing, by Prof. E. S. Holden; "New Species of Fossil Plants from Alleghany Co., Virginia," by Mr. F. B. Meek; "The Gentile System of the Omahas," by Rev. J. O. Dorsey. Most of the papers, however, appear in very brief abstracts.

ENGINEERS are engaged daily in making surveys for the purpose of determining the site of the projected tunnel under the St. Lawrence between Hochelaga and Longueuil.

THE War Office authorities have detailed a whole company of the Royal Engineers for instruction in the art of military ballooning, in lieu of the small detachment hitherto employed in the experiments. The company selected is the 24th (Field Company) at Aldershot, and it will be placed under the command of Capt. Elsdall, R.E.

ON the anniversary of the Russian Emperor's coronation, the foundation-stone of the Siberian University at Tomsk was laid. The building was projected in the reign of the Emperor Alexander I.

THE *Panama Star and Herald* of the 12th ult. says that the reports received concerning the eruption of the Fuego, the largest volcano in the republic of Guatemala, show that it was preceded by earthquakes of considerable violence, the theatre of whose operations was confined to the country surrounding the volcano, within a radius of some twenty or thirty miles. In Antigua, Amatitlan, Palin, Petapa, and several other points the shocks were of such violence as to occasion serious alarm among the inhabitants and cause them to abandon their houses for several hours. With the commencement of the eruption, however, the earthquake period ended, and the people in the streets of the various pueblos were able to witness in tranquillity the splendid appearance of the burning mountain. During the morning of the day succeeding the eruption the pueblos on the Costa Grande, to the northward of the volcano, were shrouded in gloom, and for some time after sunrise people in offices were compelled to employ artificial light in order to carry on their labours. Ashes and dust fell in great quantities at many miles distance, and people who were at too great a distance from the volcano to witness the eruption were for some time in doubt as to their origin. Happily the disturbance has passed with no more serious matter to record than the alarm which it momentarily occasioned.

At the last meeting of the Balloon Society of Great Britain the recent balloon voyage out to sea at Cherbourg was referred to. Mr. Simmons stated that when he some years ago made a similar trip at Hull he went twenty miles out to sea and then got into an anticipated return current which he found a few feet above the outward current, and which safely landed him at the desired spot on *terra firma*. The president read a letter from a member of the Society who had made one of his ascents in a thunderstorm and found the atmosphere at an altitude of about 200 feet and for a height of 100 feet to be of a dull leaden hue, but as soon as he had risen above this stratum he found the sky quite unclouded, and witnessed perfectly clearly the storm raging below in all its grandeur. On Saturday afternoon a balloon contest took place from various points in the neighbourhood of London, under the auspices of the Balloon Society. Eight balloons were to have started, but only five succeeded in getting away. A silver medal was to be awarded to the balloon that traversed the greatest distance in one hour and a half. The competition seems to have had some connection with Commander Cheyne's proposed Arctic Expedition; but so far as we have ascertained no new scientific results seems to have been obtained. One balloon seems to have attained a height of 14,000 feet.

DURING the Session of the City and Guilds of London Institute, commencing October 4, Prof. Armstrong, F.R.S., and

Prof. Ayrton, Inst.C.E., will continue their tutorial and laboratory courses of instruction in Chemistry and Physics as applied to the Arts and Manufactures, at the Cowper Street Schools, Finsbury, in rooms rented from the Middle Class Schools Corporation, pending the erection of the City and Guilds Technical College, Finsbury. Dr. Armstrong will deliver a course of about thirty lectures on "Organic Chemistry, with special Reference to its Industrial Applications," on Mondays, at 8.30 to 9.30 p.m., commencing October 4. He will also deliver a course of about twenty-four lectures on Tuesday and Friday afternoons at 4 to 5 o'clock, commencing October 5. Although the chief object of these lectures is to afford such preliminary training as is necessary for those who may desire later on to study particular branches of Applied Chemistry, more than usual attention will be given to matters of technical importance. There will also be daily Laboratory Classes. Prof. Ayrton will deliver a course of evening lectures on "Electrical Instrument Making," on Tuesdays at 8.30 to 9.30 o'clock, commencing October 5, the first twelve of the lectures being given before Christmas. On Friday evenings, at 8.30 to 9.30 o'clock, commencing October 8, Prof. Ayrton will also deliver a course of lectures, the first twelve being given before Christmas, on "Weighing Appliances and Motor Machinery," adapted to the wants of makers and users of machinery. He will also deliver a course of about twenty-four lectures on Monday and Wednesday afternoons, at 4 to 5 o'clock, commencing October 4, on the "Electric Light."

By a decree of the French Minister of Public Instruction the Ethnographical Museum at the Trocadéro has been organised. Dr. Hamy and M. Landrin have been appointed conservators.

A LARGE number of rooms have been added to the French Museum of National Antiquities at St. Germain, and are awaiting a formal opening by the President of the Republic. In one of them have been collected a series of relics of Roman age relating to religious ceremonies and inscriptions; in a second room has been disposed a large number of bas-reliefs and statues exhibiting arms and scenes of military life; and in the third room we found many sepulchral monuments showing the arts and trades as practised during the Roman rule in Gaul. Some rooms have been already opened to the public, and in one of them is the celebrated Autun mosaic representing Bellerophon triumphing over Chimæra; execution and preservation are both wonderful.

MR. ROWSELL of King William Street, Strand, has just published a catalogue which includes a large and valuable collection of scientific works, principally biological.

MESSRS. LONGMANS AND CO. announce the forthcoming publication of a new series of "Popular Lectures on Scientific Subjects," by Prof. Helmholtz, translated by Dr. E. Atkinson.

At a concert given every night in the garden of the Palais Royale, Paris, the orchestra is placed in the vicinity of the fountains, which are illuminated by eight splendid Siemens lamps, which work admirably. Two other Siemens lamps have been placed in the shop of a jeweller in the Galleries, and the experiment may eventually lead to the lighting of the whole palace by the electric light.

THE heat was so intense at Clermont on September 4 last that the ceremony of the inauguration of Pascal's statue, which was to have taken place that day, was postponed to the following morning at 8 o'clock. The principal speech was delivered by M. Bardoux, formerly Minister of Public Instruction, the representative of Clermont in the Lower French House.

THE French Central Society of Agriculture and Insectology has opened in the *Orangerie* of the Tuileries its biennial exhibition of insects. The exhibition is an instructive one, embracing

insects useful and noxious, and the various industries which depend on insects.

WE take the following from the *Electrician*:—"When a little girl is found 'playing at telephone,' and reproducing to the life the 'ways' of those who ordinarily profit by the new means of communication, the circumstance may be taken as an indication that telephony is in some localities becoming really popular. The following sketch of a baby telephonist, 'pretending' to communicate with her papa, is from the *Concord Monitor*:—She was a pretty child, happy-hearted, full of fun, and a great mimic. Only two summers had sent sunshine across her curls and waked to sensuous delight the infantile beauty and form. She dwelt in a pleasant home filled with creature comforts, among them the new innovation, the telephone. She had often watched this wonderful mechanism, and while she neither knew nor cared for the secrets of its operation, she had learned by heart the peculiar and one-sided formula of a telephone conversation. Unheeding that some one was watching her, the other day she put a little hand to the wall and imitated the pushing of the button on the telephone. Up went the other hand to the ear, as if holding the ebony cylinder, and the little miss went on in mimicry of her elders, in the following fashion:—"Hello." She then paused for an answer from the central office. "Hello. Please hitch on Mr. — house to Mr. — office." Pause. "Is 'at you, papa?" Pause. "When is you coming home?" Pause. (Turning to her dolls, the little one here spoke impatiently, "Do you keep still; I can't hear a word.") "Yes." (Rising inflection.) Pause. "I don't know." (In doubt.) Pause. "Yes." (Gleefully.) Pause. "Why papa." (In surprise.) Pause. And so the little one went on, maintaining perfectly an imaginary conversation, till at last she dropped her hand with a motion indicative of weariness from holding the telephone, and pronounced the conversational "That's all; good bye," with all the nonchalance of a veteran."

THE Proceedings of the American Antiquarian Society, No. 74, we learn from the *American Naturalist*, contains a paper by Mr. Philipp J. J. Valentini, on the Katunes of Maya history. The Katunes were a series of notable events that transpired from the time of the departure of the Mayas from their original home until their destruction. Don Juan Pio Perez, a learned Yucatecan, had found an old Maya manuscript containing this account, but failed to discover the author's name. From this precious document Mr. Valentini attempts to reconstruct the Maya chronology in the same manner that he deciphered the Mexican calendar stone. The results at which he arrives are as follows:—1. That the conquerors and settlers of the Yucatecan peninsula, as well as those of the Anahuac lakes, were joint participants in a correction of their national calendar about the year 290 B.C. 2. That about the year 137 A.D., when a total eclipse of the sun took place, the ancestors of both nations set out from their common fatherland, Tula, or Tulapan. 3. That about the year 231 A.D. both nations made their appearance on the coast of Central America, and succeeded in conquering a large portion of the peninsula.

DR. FOREL has issued in a separate form his paper from the *Archives des Sciences* on the Temperature of the Lake of Geneva and other Freshwater Lakes.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus radiatus*) from India, presented by Mr. C. Kerry Nicholls; a Common Fox (*Canis vulpes*), European, presented by Mr. E. Schweder; a Gold Pheasant (*Thaumalea picta*) from China, presented by Mr. James McGregor; a Weka Rail (*Ocydromus australis*) from New Zealand, presented by Mr. H. Frank Rose; a Brazilian Cariama (*Cariama cristata*) from Bolivia, presented by Mr.

Charles Stanley Barnes; Six Mocking Birds (*Mimus polyglottus*) from North America, presented by Mr. W. Cross; a Gannet (*Sula bassana*), British, presented by Mr. George Edson; a Sloth Bear (*Melursus labiatus*) from India, a Common Squirrel (*Sciurus vulgaris*), European, four Mississippi Alligators (*Alligator mississippiensis*) from the Mississippi, deposited; a White lipped Peccary (*Dicotyles labiatus*), two Boatbills (*Cancroma cochlearia*) from South America, purchased.

THE BRITISH ASSOCIATION

IN addition to the grants in the list which we gave last week, the following were voted at the final general meeting:—Mr. James Glaisher, Luminous Meteors, 15*l.*; Prof. Sylvester, Fundamental Invariants, 40*l.*; Prof. W. C. Williamson, Tertiary Flora, 20*l.*; Prof. Rolleston, Prehistoric Remains in Dorsetshire, 25*l.*

The total sum voted was 1,010*l.*, considerably more than the receipts of the Swansea meeting.

It is expected that the public lectures at the York meeting next year will be given by Prof. Huxley, Prof. Tyndall, and Mr. Spottiswoode.

REPORTS

Report on the best means for the Development of Light from Coal-gas of different qualities, by a Committee consisting of Dr. Wm. Wallace (secretary), Prof. Dittmar, and Mr. John Pattinson, F.C.S., F.I.C. Drawn up by Mr. Pattinson.—If gas be allowed to burn under little or no pressure it gives a smoky flame of little luminosity; when forced out under great pressure it yields a non-luminous blue flame like that of a Bunsen's burner. The aim in constructing a good gas-burner is so to regulate the supply of air and so to control pressure that the maximum amount of light may be obtained. This is best accomplished by an Argand burner.

From series of tables showing the result of experiments, the following conclusions are drawn:—The illuminating power is increased as the gas, issuing with less velocity, is mixed or brought in contact with less air. No increase in illuminating power is produced by heating the gas before its combustion. This confirms the results obtained by the London Gas Referees in 1871. By heating the air admitted to the centre of a standard Argand burner to 520° F., an increase of light amounting to 9 per cent. was produced for a rise of 45° in temperature. The trouble and expense of heating the air would probably prevent the adoption of this means of increasing the luminosity. With ordinary flat-flame burners the greatest amount of light is evolved under a pressure of one inch of water.

After giving measurements of the intensity of light evolved by gas burned in various varieties of burners (Bray's, Silber's, and Sugg's), the author concludes that the luminosity depends, so far as the burner is concerned, on the amount of gas burnt and on the pressure. The only burner presenting undoubted advantages over others, and that owing to more perfect regulation of air-supply, is the Argand burner; but on account of its expense, the trouble of keeping it clean, and the necessity of employing a governor for each burner, it is improbable that it will come into general use. Governors are now constructed for single burners by Sugg, Peebles, Wright, Borradaile, and others. Such governors are of great service, not only in saving gas, but also in regulating supply and giving constancy in luminosity.

Thirteenth Report of the Committee, consisting of Prof. Everett, Prof. Sir William Thomson, Mr. G. F. Symons, Prof. Ramsay, Prof. Geikie, Mr. F. Glaisher, Mr. Pengelly, Prof. Edward Hull, Dr. Clement Le Neve Foster, Prof. A. S. Herschel, Mr. G. A. Lebour, Mr. A. B. Wynne, Mr. Galloway, Mr. Joseph Dickinson, Mr. G. F. Deacon, and Mr. E. Welhered, appointed for the Purpose of investigating the Rate of Increase of Underground Temperature downwards in various Localities of Dry Land and under Water. Drawn up by Prof. Everett (secretary).—Observations have been taken in the Talargoch Lead Mine, Flintshire (between Rhyl and Prestatyn), under the direction of Mr. A. Strahan, of the Geological Survey, and Mr. Walker, Chairman of the Board of Directors of the mine.

The top of the shaft is 190 feet above the level of the sea. The lowest workings are 900 feet below sea-level. The veins run across an angle of Carboniferous Limestone, bounded on both sides by